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SCIENCE

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THE SECOND INTERNATIONAL CONGRESS OF EUGENICS ADDRESS OF WELCOME

I DOUBT if there has ever been a moment in the world's history when an international conference on race character and betterment has been more important than the present. Europe, in patriotic self-sacrifice on both sides of the World War, has lost much of the heritage of centuries of civilization which never can be regained. In certain parts of Europe the worst elements of society have gained the ascendancy and threaten the destruction of the best. At this moment we welcome the sound and highly trained judgment of Major Leonard Darwin, leader of the eugenics movement in Great Britain; of Dr. Lucien March, the leading statistical authority of France, also leader in the eugenics movement and senior representative of the eugenics movement there; of Dr. Lucien Cuénot, foremost student of the science of heredity in France; of Dr. G. V. de Lapouge of France, the leading authority on racial anthropology and earnest exponent of practical eugenic measures by the government. Dr. Jon Alfred Mjøen of Norway is the leader in the vigorous movement of race hygiene in Scandinavia. Contributions are welcomed from other representatives of Great Britain, of France, of Italy, of the new Republic of Czecho-Slovakia, of our sister Republic of Cuba, and of South and Central America. The leading students of heredity, of statistics, of anthropology, and of eugenics in the United States are here to welcome their frères from abroad.

To each of the countries of the world, racial betterment presents a different aspect. To the five countries most closely engaged in the recent fratricidal conflict, the financial and economic losses of which we hear so much are as nothing compared with the spiritual,

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intellectual, and moral losses which each has sustained. In the Scandinavian countries, which kept out of the conflict, and to a large extent in the United States, the case is different. In Scandinavia, which I have recently visited, it is largely through the active efforts of leaders like Mjøen and Lundborg that there is a new appreciation of the spiritual, intellectual, moral, and physical value of the Nordic race, and that a warning is being given that it must not be too severely depleted by emigration. Nearly half that race is now in the United States.

In the United States we are slowly waking to the consciousness that education and environment do not fundamentally alter racial values. We are engaged in a serious struggle to maintain our historic republican institutions through barring the entrance of those who are unfit to share the duties and responsibilities of our well-founded government. The true spirit of American democracy that *all men are born with equal rights and duties* has been confused with the political sophistry that *all men are born with equal character and ability to govern themselves and others*, and with the educational sophistry that education and environment will offset the handicap of heredity. South America is examining into the relative value of the pure Spanish and Portuguese and of various degrees of racial mixture of Indian and Negroid blood in relation to the preservation of their republican institutions.

In my recent tour through Belgium and all parts of France, I was deeply impressed with the very slight convergence produced by 12,000 years of similar environment and a thousand years of similar education upon the three divergent races of which France is composed,—the Mediterranean, the Alpine, and the Nordic.

The constructive spirit of this Congress is to discover the virtues and the values of each of these minor divisions of the human species, as well as the needs of the major divisions, known as the Caucasian, the Mongolian, and the Negroid. The reason that these races are so stable and maintain their original charac-

ter so stoutly is that the most stable form of matter which has thus far been discovered is the germ plasm on which heredity depends. This outstanding fact of heredity will be brought out in the First Section of the Congress. As a palaeontologist and geologist, as well as something of a biologist, I find no form of matter so stable in nature as that on which heredity depends—consequently the selection, preservation, and multiplication of the best heredity is a patriotic duty of first importance. In the selection of the best we should know no prejudice. If we extenuate nothing, we write down nothing in malice. The 500,000 years of human evolution, under widely different environmental conditions, have impressed certain distinctive virtues as well as faults on each race. In the matter of racial virtues, my opinion is that from biological principles there is little promise in the "melting pot" theory. Put three races together, you are as likely to unite the vices of all three as the virtues. This opinion, however, awaits the experimental proof or disproof which will be presented by researches such as those of Doctor Sullivan in the Hawaiian Islands. For the world's work, give me a pure-blooded Negro, a pure-blooded Mongol, a pure-blooded Slav, a pure-blooded Nordic, and ascertain through observation and experiment what each race is best fitted to accomplish in the world's economy. If the Negro fails in government, he may become a fine agriculturist or a fine mechanic. The Chinese and the Japanese have demonstrated in the history of their respective countries a range of ability in art, literature, and industry quite equal to our own in certain arts, and greatly superior to our own in other arts, like ceramics. Let each race consider its own problems and demonstrate its own fitness.

Our Fourth Section is devoted to the state. The right of the state to safeguard the character and integrity of the race or races on which its future depends is, to my mind, as incontestable as the right of the state to safeguard the health and morals of its people. As science has enlightened govern-

ment in the prevention and spread of disease, it must also enlighten government in the prevention of the spread and multiplication of worthless members of society, the spread of feeble-mindedness, of idiocy, and of all moral and intellectual as well as physical diseases.

I would not anticipate the findings of any of the four sections into which the work of the Congress is divided, but I would express my opinion that the monogamous family, *i.e.*, one husband, one wife, is to be maintained and safeguarded by the state as well as by religion as a natural and hence as a patriotic institution. In Doctor Lowie's very able recent work, "Primitive Society," it is shown that in general the family is safeguarded; that the natural instinct so widely prevalent among all social lower orders of animals to preserve the family at all costs dominates the elementary morals of primitive races. It is not an exaggeration to say that many tendencies in recent social development, as distinguished from racial evolution, are against this natural mandate regarding the family. The wisdom of British biologists, expressed by Tennyson in his memorable lines:

So careful of the type . . .
So careless of the single life,

has been transmuted into the fatal reverse

So careful of the single life . . .
So careless of the type.

The closing decades of the nineteenth century and the opening decades of the twentieth have witnessed what may be called a rampant individualism—not only in art and literature, but in all our social institutions—an individualism which threatens the very existence of the family; this is the motto of individualism: let us obey our own impulses, let us create our own standards, let each individual enjoy his own rights and privileges—for tomorrow the race dies. In New England a century has witnessed the passage of a many-child family to a one-child family. The purest New England stock is not holding its own. The next stage is the no-child marriage and the extinction of the stock which laid the

foundations of the republican institutions of this country.

It is questions of this kind which are being set forth before this Congress so that they may be disseminated among our people. Let us endeavor to discard all prejudices and to courageously face the facts. Recent works by Bury and Inge on human progress are regarded in some quarters as pessimistic. I do not regard them as pessimistic, because to my mind the pessimist is one who will not face the facts, and these writers, especially Inge, look at the worst as well as at the best. I regard an optimist as one who faces the facts but is never discouraged by them. The optimist in science is one who delves afresh into nature to restore disordered and shattered society. This was the constructive spirit of Francis Galton, founder of the science of eugenics. I trust it will be the keynote of this Congress. To know the worst as well as the best in heredity; to preserve and to select the best—these are the most essential forces in the future evolution of human society.

HENRY FAIRFIELD OSBORN

THE AIMS AND METHODS OF EUGENICAL SOCIETIES

INTERNATIONAL CONGRESSES are organized no doubt mainly with the object of enabling workers in the same field both to become personally acquainted with each other—a far-reaching benefit—and to exchange information and ideas. We who have just crossed the Atlantic have come to a land in which many notable institutions have long been engaged in the study of biology and genetics, these being the pure sciences on which the applied science of eugenics is based, and where human racial problems have also long been keenly investigated. So much has been done in all these directions here that when I was honored with an invitation to address you I felt great difficulty in selecting a subject which I could discuss with any reasonable prospect of promoting our common aim, namely the improvement of the racial qualities of future generations. It is, however, not only scientific information

which we can now profitably exchange one with another, but also our actual experiences; and, as I have been for ten years president of a British society for the promotion of eugenics, it occurred to me that it might interest you to hear something about our aims, our methods and our difficulties. I look forward to the time when eugenical societies will exist in all populous centers, their work being to strive to build up a social superstructure on the scientific foundations laid by central organizations engaged in biological and eugenical research. Whilst these much needed societies are passing through the period of their adolescence, we may be sure that they will not be without their growing pains and their difficulties; and these difficulties will certainly be more easily overcome if clearly realized in advance. I hope, therefore, that existing societies will not scruple to air their troubles in public!

When an association is being created with any social object in view, a demand is likely to be made for a clear and rigid definition of the policy which is to be promoted by it; and from such demands may arise not only the first juvenile ailments of eugenical societies, but also occasional internal inflammations later in life. Now I was recently asked to state once again in broad and general terms what are the aims of my society, such a statement being needed not so much for our own information as to enable us to make our position more clear to the general public. The main difficulty in replying to this request lay in the fact that experience has taught us that attempts to decide in detail exactly what may be advocated and what should be condemned by eugenists are more likely to do harm than good by unduly restricting eugenic activities. A choice has always to be made between a smaller society with narrower aims and a larger society tolerating wider divergences of opinion; and although both plans have their advantages, yet in a young and growing subject like eugenics care should be taken not to injuriously hamper future liberty of action by too rigid definitions of policy. What seemed to me to be needed was a eugenic sign post, with arms pointing, not to every by-path, but to the various main

roads along which our society should strive to advance; and the conclusions I then reached I now repeat in the hope that they may prove to be of some interest to a wider circle of friends.

The first words which I uttered as the president of my society ten years ago were that heredity should be its guiding star, and in that opinion I have never faltered. A good deal of progress has been made since that date, and now the man who calls himself well educated is as a rule beginning to have some dim idea that all human beings are the product of two factors, heredity and environment, and that consequently to both of them some attention should be paid. Now if a eugenical society accepts only one of these factors, namely heredity, as the foundation on which all its operations ought to be built, its members should as individuals most clearly emphasize the fact that all those who are striving to improve human surroundings have their warm sympathy. Of course eugenists cannot approve of such measures as would injure mankind as a whole, the future as well as the present being taken into account; but, putting that possibility aside, we personally should give our blessing to many reforms which eugenical societies do not help to promote. We see as clearly as anyone that to take steps tending to produce in the future a race with the best possible natural qualities would be a futile proceeding unless we hoped that when such a race did appear great care would be taken to give to it good surroundings. If eugenical societies confine their attention exclusively to heredity, it is only because so many other societies think only of environment.

It is true that sometimes it may be necessary to indicate that the high hopes entertained by reformers of to-day are not justified by past experiences. It may be said with only a microscopic divergence from the truth that all reforms since civilization began have been based on attempts to improve human surroundings; and we may ask those who found their hopes for the future only on changes being made in environment to consider how much has thus been accomplished since history began. As to our highest moral ideals, is it not true that for

the most part they have been promulgated in certain eastern countries ever since the dawn of civilization? How do we compare in intellect with the inhabitants of ancient Greece two thousand years ago? With a knowledge of the delights of country life, can we look on our slums with anything but shame? Do we not blush to talk of peace on earth and goodwill towards men whilst remembering what has happened during the last seven years? And, in view of all this, have we any right to assume that improvement of environment will do more for mankind during the next two thousand years than it has done since the days of Plato? Reformers who look only to surroundings should consider well the foundations on which their projects are based before pointing the finger of scorn at the believers in heredity. Eugenics has been called a dismal science, but it should rather be described as an untried policy. Eugenics indicates a new method of striving for human welfare which, if combined with an equal striving for improvements in human surroundings, more truly justifies a hopeful outlook than anything which has yet been tried in the whole history of the world. More hopeful, that is, if the roads to which our eugenic finger post is pointing are not as studiously avoided in the future as they have been in the past.

The eugenic signpost which we wish to erect should, in my opinion, have three arms on it, pointing to three main lines along which an advance should be pressed forward. In the first place the public should be made to realize more and more fully what a potent influence heredity has on the fate of all nations. In the second place efforts must be made to ascertain and to make known the rules by which each individual ought to strive to regulate his own conduct in regard to parenthood in accordance with the laws of heredity in so far as they are now surely known. Lastly, the action which the state should take in order to stimulate and to enforce conduct productive of racial progress must be considered, a line of advance to be advocated, however, with great circumspection when compulsion is concerned. Our aim must

be to advance along all these three roads simultaneously and continuously.

The laws of natural inheritance supply a means of predicting in a measure the qualities of offspring when the qualities of their parents are known; and if any society accepts heredity, not as its sole guide, but as a light ever to be held in view, it is in fact intending to rely to some extent on these laws of natural inheritance when attempting to forecast the results in the future of our actions of to-day. Genetics is the pure science which deals with heredity, and genetics is, therefore, the very foundation on which the superstructure of eugenics is being built. The students of genetics will, however, I am sure, all agree that a vast amount of research is needed before they will be able to rest satisfied with the knowledge they have acquired, supposing it to be possible that such a state of contentment will ever be reached. Now it is impossible to conduct the needed breeding experiments on human beings, and genetic research must be largely concerned with the lower animals and with plants; whilst eugenics is primarily concerned with man alone. Then again eugenics must include the study of many social and economic problems which lie quite outside the sphere of genetics. The pure science of genetics and the applied science of eugenics do, therefore, cover different fields, though the boundary between them is ill defined and movable; and in both fields further advances are urgently needed. For these reasons it seems to me—though here opinions may differ somewhat—that the main aim of eugenic societies should now be, whilst leaving geneticists to cultivate their own ground, to formulate a sound eugenic policy based on existing genetic knowledge, and then to promote the translation of every advance in eugenic theory into general practise. If we eugenists rely on scientific experts for the laying of our scientific foundations, then we shall be able to devote our main energies to the advocacy of reforms tending to promote racial progress and to considering how wide may be the area over

which such reforms can be justifiably extended.

With regard to much of the research work which is so urgently needed, most eugenical societies will indeed have no option but to leave it to others or to leave it undone; because in many lines of enquiry a well equipped laboratory and a highly skilled staff are essential for success. Certain investigations, which need no special apparatus, however, could be carried on anywhere. Moreover, the scientific material as received from geneticists often needs to be thoroughly discussed by eugenists in a scientific spirit before being applied to human affairs; and we must not rely wholly on genetic research for the supply of scientific material on which to build. Wealthy patriots in all countries will doubtless from time to time perceive that by their wealth they might help to promote the acquirement of that knowledge on which racial progress must depend in the future. A strong central society might in such cases play a useful part in suggesting various directions in which, with their aid, advances of great value could at once be made; as well as being ready, if so desired, to act as agents by whom the investigator would be selected and employed, care being taken not to hamper him with undue control. The more liberal the benefaction the more fundamental and far-reaching might be the researches thus undertaken, and the greater the ultimate benefit to mankind. Your endowments in America are so magnificent that you may not fully perceive how much they are needed elsewhere.

As to the first of the suggested lines of advance, namely, as to getting into direct and immediate touch with the public with the hope of spreading abroad a general knowledge of the laws of natural inheritance, this knowledge should form the basis of all the arguments brought forward at public lectures on eugenics, that is, at lectures not forming part of any extensive series. It is indeed in laying this foundation of scientific truth that speakers on such occasions encounter their greatest difficulties; for many prejudices arising

from ignorance have to be overcome. For example, those who do not acknowledge to themselves that men differ greatly from each other in their inborn qualities, cannot be made to realize the extreme importance of paying attention to heredity in regard to social questions; and the acknowledgment that we do not start even in the race of life will be hindered by a disinclination which we all feel both to regard any human disabilities as being incurable and to own that other individuals may be greatly superior to ourselves. As to the facts on which the scientific theories of heredity are based, it is worse than useless to attempt to give them in detail at single lectures; for lecturers should remember that on such occasions they cannot hope to do more than leave an enduring *general* impression on the minds of their audiences. Except in systematic courses of study, much must always be both stated and accepted on authority; for to fully justify all the beliefs of eugenists would require months rather than days. "It is hardly possible," so my father declared, "within a moderate compass to impress on the minds of those who have not attended to the subject, the full conviction of the force of inheritance which is slowly acquired by rearing animals, by studying the many treatises which have been published on the various domestic animals, and by conversing with breeders."¹ If this be so, the public can only learn how to give to natural inheritance its proper value by acquiring information at second hand; and yet to make any statement acceptable to audiences, it must be in some degree endorsed by their own reasoning powers. It is on this account that allusion to the breeding of domestic animals becomes almost a necessity in public lectures on eugenics, for the wisdom of attending to breed in the case of cattle and dogs is universally admitted. Great care should, however, always be taken to indicate that, though our experiences in the stockyard enable us better to understand the laws of natural inheritance, yet our reliance on these

¹ "Animals and Plants under Domestication," Darwin I., pp. 447-448.

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laws carries with it no implication whatever that the methods of the animal breeder ought to be introduced into human society. It should in fact be most strongly emphasized that nothing which we advocate is contrary to the highest religious ideals. This is, however, rather a digression; for I am not here to instruct lecturers how to lecture. All that I now wish to insist on is that, by means of lectures to audiences of all kinds, the endeavor to spread abroad sound impressions concerning the force of natural heredity and the enormously important influence which it has in deciding the welfare and the destiny of nations should form a prominent part of the programme of all eugenical societies.

The title selected for the British Society by its founders was the Eugenics *Education* Society, and certainly they had excellent reasons for thus emphasizing the educational aspects of the eugenic campaign which they were inaugurating in my country. No class of the community is more important to interest in racial problems than teachers of all grades; because the ideas of the youth of to-morrow will depend so largely on the opinions of the teachers of to-day. But teachers must be taught before they can take a thoroughly intelligent interest in racial questions; and for this reason it is of primary importance that biology should be given adequate recognition in the curricula of all colleges where teachers are trained. Our educational aspirations could not, however, be completely satisfied in this way; for to finally succeed in the first of our main aims, namely, the spreading abroad of a general knowledge of the laws of natural inheritance, natural science must be given a far more prominent place than at present in the courses of studies of all schools and colleges. No doubt there are many who now regard our efforts with great distrust; but those who feel thus should remember that the better and the more widespread the teaching of biology, the more certain would it be that any eugenic errors would be detected and their harmful influence prevented. Moreover, if we want progress in scientific research to be both rapid

and on right lines, it is important that a considerable number of students should be thoroughly trained each year in genetics, or that more undergraduates should specialize in natural science at our universities than at present. Eugenics has a long struggle before it, and all these methods of laying educational foundations for future progress should certainly come within the scope of the efforts of eugenical societies.

Passing on to the second of the main lines along which eugenical societies should strive to advance, what we want to know is the rules which ought to guide each individual in deciding on his own voluntary actions in all matters relating to racial progress. The attempt to ascertain the precepts by means of which each one of us should strive to regulate his conduct in questions connected with parenthood obviously involves the consideration of a number of ethical, racial and economic factors; for, in regard to any proposed line of conduct, we have to weigh in the balance as well as we can its moral effects, the immediate material advantages or disadvantages to the family and to the state which are likely thus to arise, and the benefits or injuries which it will confer or inflict on the race in the future. Even if these problems be approached in a calm and scientific spirit—and in this respect eugenical societies should strive to set a much needed example—even then it will be exceedingly difficult in most cases now to arrive at precise conclusions. We must not attempt in the present state of our knowledge to lay down rigid rules of conduct, but only to suggest general guiding principles; though we may hope that with every advance of science it will be possible more and more clearly to indicate what each individual ought to do and what he ought to avoid. As an illustration of the difficulties involved in these problems, consider the case of a contemplated marriage when both families thus to be connected are characterized by some degree of ill health. Now it would only be persons endowed with high moral qualities who would be likely to obey any self-denying ordinance in regard to mar-

riage and whose fertility would, therefore, thus be diminished. Might we not, by condemning marriage in such cases, tend to breed out the most valuable of all human attributes, namely, the desire to do right? Again if insanity were the family trouble in question, this being one of the most grievous of all human ailments, we now know that it is sometimes the result of disease and probably in such cases not heritable, whilst other types certainly do run in families. What are we to do in the face of such doubts and difficulties as these? Are we to admit our incapacity to meet the situation? Certainly not, for the history of scientific research clearly proves that what to-day appears like an impenetrable barrier to further progress will probably tomorrow be regarded rather as a useful stepping stone for a further advance. Doubtless we have difficulties ahead of us, which must be faced with patience; but we should take note of these obstacles in our path mainly as emphasizing the need for societies where such guiding rules for voluntary conduct in relation to parenthood as are warranted by existing knowledge and by present needs will be wisely and temperately discussed.

A comparatively new subject like eugenics is apt to arouse prejudices and to give opportunities for misapprehension; and it sometimes seems that what is now most needed on the part of eugenic societies in regard to voluntary actions is that they should make clear what they are *not* recommending. We have been accused of wishing to abolish love altogether as a guide to conduct; but this is false. What we desire is rather to purify love, or to clear away all those harmful influences which so often attach themselves to it. Certain American investigations indicate that the ideals which naturally dwell in the minds of young people in regard to the qualities of the mates to whom they would wish to be connected in marriage are on the whole fairly sound, and that these promptings if followed would generally lead to unions beneficial to the race. But the desire for wealth, the wish to rise in the social scale, and, some would add, too great attention to personal appearances, often make

the choice of a mate far worse than it would have been if these natural ideals had been given full sway. In passing I must, however, put in a racial plea for good looks on the ground that they are apt to be associated with good health; a plea which I hope does not spring from a mere masculine weakness on my part. Be that as it may, love is doubtless to a large extent aroused by advantageous moral and mental qualities; and, in so far as that is the case, it forms the firmest foundation on which to base a eugenic policy. Much can be done to help to lay this foundation by promoting suitable opportunities for the meeting of young men and maidens; by judiciously encouraging intercourse between our children and worthy friends of the other sex, from amongst whom worthy mates are not unlikely to be selected; by stimulating a pride of family in so far as dependent on character and performance; and, above all, by fostering the growth of all that is noble in the ideals of the adolescent. Never make a close friend of a person one can not respect is, I believe, not only a helpful rule of life, but also a useful way of setting an example to the rising generation. But here a possible racial danger must be noted; for an injudicious pursuit of the policy here suggested might make the high-minded become too particular and therefore less likely to marry than their more ordinary companions, with obvious dysgenic consequences. Pure love between the sexes should be proclaimed as the noblest thing on earth, and the bearing and rearing of children as amongst the highest of all human duties. Some risks ought to be run in order to secure these joys and to fulfil these duties; and Cupid may well remain a little blind to all minor defects. To promote these ways of regarding sexual problems and to show how often the moralist unknown to himself is in effect striving to better the racial qualities of future generations come well within the scope of our endeavors.

Though we have seen that as knowledge increases so the difficulties of deciding on rules of personal conduct will diminish, yet it is certain that these difficulties will ever remain very

formidable. We may now boldly assert that when the heritable defects of many members of a family are very serious, those belonging to it should not become parents; but how serious must these defects be before being regarded as a bar to parenthood? It will never be possible to draw as sharp a line of demarcation as that between sheep and goats when marking off from the general population those in whom parenthood would be a moral offense. Because of this impossibility, it may come to be held that the size of the family should vary with the innate qualities of the parents; but how is this relationship between fertility and transmissible characteristics to be determined? Then, again, many who take no thought concerning racial questions now hold strongly that it is wrong to bring a child into the world without a reasonable prospect of its being able to live a life up to a certain standard of civilization. But what should be the standard adopted? In large numbers of cases the cause which has prevented the winning of a "standard" livelihood, however we may define that term, has been some inborn defect, or defect which would in a measure be passed on to the next generation. Teach those not living up to standard to regulate their conduct with due regard to the welfare of any children who may or may not be born in the future, and many would limit their families on this account; with the results that these harmful innate defects would appear less frequently in future generations. Is it not, therefore, of great importance that some attempt should be made to ascertain what standard of living does justify parenthood? Again it is even more important that it should be widely felt that it is morally wrong to limit unduly the size of the family when parents are up to "standard" in all respects; for it is essential for the welfare of mankind that the seed of this good stock should not be lost to posterity. Eugenical societies should, in my opinion, steadily keep in view the necessity of trying to solve all these intensely difficult problems; problems which need the joint consideration of the eugenist, the geneticist, and the economist for their solution. But as for our advice of to-day concerning personal conduct

in regard to procreation, we can say little more than that moral principles must always be kept in the foreground, and that, for the rest, trust must be placed in common sense and a wise doctor.²

To whatever extent success may attend our efforts to lay down rules for personal conduct in regard to parenthood, to that extent we shall have succeeded in deciding on the directions in which we wish to advance in these matters. Such decisions will, however, prove to be but a very uncertain indication of the extent to which the state should endeavor to promote or to enforce obedience to these rules; this being the subject to which we must now turn our attention. By promoting uniformity of conditions and by checking individual initiative, the state often retards progress; and, besides affecting those intended to be affected, governmental action nearly always produces on other persons various consequences which were unforeseen and which are never fully realized. Whatever may be our political opinions, we nearly all of us agree that these are dangers which must be taken into account when contemplating state control over the individual. These are, however, large issues which some will regard as lying outside the proper scope of eugenic considerations; whilst the point which I especially wish to emphasize in this connection is one definitely related to the actions of eugenical societies. In my opinion our societies ought to be ready to encourage *discussion* on all proposals for relevant reforms, whilst they should be cautious in the present state of our knowledge in actually recommending *governmental interference*. If discussion be not bold, progress will be slow; for a nation can not grope its way quickly to the front in the darkness of ignorance. If action be too bold, progress will also be slow; for the wrong road will often be taken. In matters of conduct we should balance the *probability* of good or evil arising from the action proposed to be taken, as against the *magnitude* of the good or evil if it does arise. The smaller the chances of failure, the smaller may be the benefits hoped to be

² I assume that the doctor has studied genetics, which is unfortunately not always the case.

attained. The probability of harm resulting from the mere discussion of any reform would usually be very small, even if that reform would be very harmful if adopted. On the other hand, the possibility of benefits arising from the discussion of reform is almost equally obvious whether the proposed legislation would in fact be beneficial or harmful. To take a single example, there are strong differences of opinion as regards sterilization; but all may hold that by open discussion true conclusions would most likely be reached. The advocates of sterilization of course wish to have this subject brought to the notice of the public; whilst its opponents must admit that they will be more likely to promote than to retard its introduction by, as it were, burying their heads in the sand like the ostrich and by refusing to favor the creation of opportunities for openly stating their objections to it. It is indeed nearly true to say that every subject may be openly discussed with advantage *provided the occasion be properly chosen*; and it is in this spirit that eugenical societies should, in my opinion, conduct their proceedings.

In all human affairs we are constantly being compelled to take opposing considerations into account and to adopt compromises, and I think that I ought not to be accused of inconsistency if I now turn round and show why eugenical societies ought not to be too timid in regard to legislation. As to your middle-aged Anglo-Saxon, and I am only speaking for my own country, there is hardly anything which he dislikes so much as having to change his opinions; and from this weakness men of science are by no means exempt! Here is a barrier which will stop any half hearted advance on the part of eugenic reformers! To the students of natural sciences, at all events, we can suggest that Nature's plan seems to have been to stamp out of existence all organisms which fail to fill the places she assigns to them, and this without regard to the sufferings thus caused or to the superiority in many respects of large numbers of the individuals thus eliminated. By adopting rational methods in human affairs, much can be done and much ought to be done to prevent human beings from being enforced

to sufferings similar to those which animals in the wild have to endure because of that struggle for existence to which they must submit; but nevertheless we should not be quite blind to the example set us by Nature in her readiness to sacrifice the individual for the sake of the race. Unfortunately it will be our politicians who will mainly settle how far the teachings of science shall be made to affect legislation; and this they will be apt to do with little reference to the opinions of experts and largely in the hope of catching votes. But the votes of future generations can not now be caught, and their interests will, therefore, be likely to receive but scant attention in all democratic countries. Governments which depend on the suffrages of the people are of necessity always somewhat timid in regard to unpopular reforms; and until eugenics becomes popular—when will that be, I wonder!—there is not the slightest chance of eugenic reform moving forward with too rapid strides. Eugenists must lead the advance in racial questions, and our societies must remember that nothing is more fatal to leadership than a show of timidity. We should discuss long and freely, and when we do advance, advance boldly.

Legislative reforms can seldom be effectively promoted or steadfastly maintained unless they are sanctioned by the general opinion of the citizens concerned; and, on somewhat similar grounds, eugenical societies would be wise to avoid taking corporate action in regard to legislation unless the proposal in question has the nearly unanimous approval of their members. The neglect of such warnings has led to the disappearance of governments and to the disruption of societies! When legislation does not involve compulsory interference with the liberty of the individual, there is comparatively little danger of internal friction being caused by its advocacy; for unanimity in such circumstances is both more probable and less necessary than when compulsion is involved. As examples of legislation of general application producing beneficial racial effects, certain reforms in regard to taxation might be mentioned. My

Society took an active part in the agitation in favor of such alterations in the assessment of income tax as would make the burden of taxation fall less heavily on parents of families and more heavily on bachelors and the childless *in the same stratum of society*, the object being to increase the birth rate of a useful class of the community. As to legislation involving interference with individual liberty, here also unanimous support can be obtained if the racial advantages are sufficiently obvious. For example, there was no dissension whatever in my society when we moved in favor of the Mental Deficiency Bill, a bill which authorized the segregation of the feeble in mind, that is to say, their detention in comfort under carefully safeguarded conditions. But until unanimity in the ranks of a eugenic society in regard to such compulsory measures is obtainable, their discussion only is to be recommended. Personally I should like to see practical steps at once taken for lessening the fertility of habitual criminals, of hopeless wastrels, and of the grossly unfit generally, and others doubtless wish to advance in other directions; but we must have patience. My object for the moment is not, however, to attempt to survey all the roads by which advances may be made in future, but rather to consider what should be the broad principles of strategy which should guide eugenic societies in the long fight before them in their attempts to promote racial progress.

Thus I have dealt with the *objects* which eugenic societies should strive to attain rather than with the *methods* of attaining the ends desired, the reason being that I have little novel to suggest in regard to methods. With the view to the advancement of scientific knowledge and the elucidation of eugenic problems, my society holds periodical meetings at which addresses are delivered or questions debated. In our *Review* these addresses are often published, and we there also try to give impartial accounts of current eugenic literature. We maintain a library, and give advice to readers. We keep in touch with foreign societies, and it has been an especial pleasure to us to give all the assistance in our power to the

American committee which has so admirably organized this Congress. As to activities definitely undertaken for the purposes of propaganda, the following may be mentioned: the delivery of lectures to audiences of various types, including social clubs, debating societies, educational conferences, summer schools for teachers, and, during war times, soldiers in camp and barracks; the organization of summer schools dealing largely with eugenics; the sending of deputations to government departments; and of letters to the press. To take one example in detail, after a thorough enquiry concerning the incidence of our income tax, a letter was written to all members of Parliament, and at a later stage amendments to the Finance Act were proposed by members at our suggestion, and were rejected! The next step, a direct result of this agitation, was the appointment by the government of a royal commission on the income tax before which I gave evidence on behalf of my society. Several of the recommendations of that commission, representing a step forward in the direction desired, were subsequently adopted and became law. Thus by steady persistence on well thought out lines a society may be able to produce material effects in many directions. As a last word about the doings of my own society, I must be allowed to mention a dinner followed by an address, held on February 16 in each year. In this way we yearly remind ourselves on the birthday of Sir Francis Galton that to him we owe the opening of the eugenics campaign in England.

What I have tried to do in my address today has been to give some indication of the difficulties likely to be encountered by youthful eugenic societies; difficulties which, we have seen, may come from many quarters and in many shapes. Questions connected with both sex and personal liberty have to be dealt with by eugenists, and these are topics especially liable to give rise to strong feelings. Even when the opposition thus aroused is quite unreasonable, we should, however, always remember that the sentiments underlying this opposition are often in many respects highly commendable, and that to openly

acknowledge where others are in the right is often the best way of getting a hearing for ourselves. The most formidable foe we have to meet is ignorance; and here again it is wise to admit that the ignorance is not all on one side. With every growth in our knowledge of biology and sociology we shall be able safely to enlarge our programme, and we should make it clear that our discussions of to-day are often tentative and do not always indicate the directions in which we shall advance to-morrow. As to the ignorance of our opponents, it can only be overcome by patience, perseverance and above all by never concealing such doubts as are still felt. Unfortunately it must be admitted that even perfect knowledge, however widely held, would not make our path quite smooth, human nature being what it is; for the want of attractiveness of our programme is largely due to the fact that we are looking to human welfare in the more or less distant future and not to present-day comforts. Most men in their march through life are hoping either for personal distinction as a reward for their exertions or for quick returns on their investments; and neither of these benefits is to be obtained in the eugenic market. You can easily enough get your forests cut down and the timber sold for an immediate profit; but the planting of slow growing trees, which will not be worth felling till most of us are dead, is a less attractive venture, though more beneficial to the nation. The reforms which the eugenist wishes to plant would certainly bear excellent fruit in due course, even though much of it would only be gathered by our children and our children's children. Then again your business men not seldom try to sell their goods by running down the wares produced by their rivals, an inexcusable proceeding in so far as merely an outcome of greed and jealousy. Now this same competitive spirit is far too much felt in social work, and I fear we eugenists have often aroused opposition by unnecessarily running down reforms dependent on changes in environment. Let us rather strive to show that there is plenty of open ground over which reformers of all kinds can

strive to advance simultaneously and harmoniously; and let us all recognize that jealousy is one of the commonest and probably the most insidious of all human failings. The claims of this generation and of posterity are doubtless sometimes antagonistic, and the genuine difficulties thus arising must be openly faced and often met in a spirit of wise compromise. The main obstacles to be overcome by eugenists are, however, dependent on moral failings, and what we have to show is that we are engaged in a moral campaign, with human welfare in the highest sense as the goal for which we are striving.

Eugenics aims at increasing the rate of multiplication of stocks above the average in heritable qualities, and at decreasing that rate in the case of stocks below the average. But if the banner under which we are to fight should only have inscribed on it some such arid definition of policy as this, our defeat would be certain. We must prove that we are under the guidance of a noble ideal. We of this generation are responsible for the production of the next generation and, therefore, of all mankind in the future; and all in whom this sense of racial responsibility acts as a deep-seated sentiment, greatly affecting their action and their policy, are in truth guided by the eugenic ideal. The belief that man has been slowly developed from some ape-like progenitor came towards the close of the last century to be nearly universally held by thoughtful persons; this belief gave rise to a new hope that this upward march of mankind might be continued in the future; and out of this new hope sprang the eugenic ideal. This growing understanding of the past history of the world has led us to see that, if we are to imitate Nature in her methods, we must be content to advance by means of a long succession of small steps; just as rain falling in drops on the earth has slowly carved out mighty valleys in the hardest rocks. Without constructing wild Utopias, we must be content if some little racial progress can be ensured as each generation succeeds another; for to work in this spirit is to work in harmony with the knowledge which gave birth to the eugenic ideal. Progress on eugenic lines will

make mankind become continually nobler, happier, and healthier; whilst those who imagine that our sole aim is to make man a stronger animal or a better beast of burden are utterly ignorant of the meaning of the eugenic ideal. But science, whilst giving us good grounds for hope, also issues a grave warning concerning the danger of national deterioration resulting from the unchecked multiplication of inferior types. In the past many nations of the first rank, when apparently advancing without check on the path of prosperity, have begun to decay from unseen causes, and have in time so fallen from their high estate as to cease to count as factors making for progress. A determination that such a downfall shall not be the fate of his nation is a sentiment felt by every man who is animated by the eugenic ideal, an ideal to be followed like a flag in battle without thought of personal gain.

LEONARD DARWIN

FREDERICK MORTON CHAMBERLAIN

FREDERICK MORTON CHAMBERLAIN died on August 17, 1921, in a hospital in Oakland, California, after a long and sometimes hopeful fight against tuberculosis. He became seriously ill in July, 1913, while on the Pribilof Islands, and although he partially regained his health for short periods, he was at no time thereafter able to resume his usual activity. The U. S. Bureau of Fisheries has thus lost one of its most faithful employees, one whose clear, keen mind and charming personality will long be mourned by his associates.

Mr. Chamberlain was born in Indiana, June 29, 1867. He graduated at the State Normal School at Terre Haute in 1894, the State University at Bloomington in 1896 and the George Washington School of Law in Washington, D. C., in 1913. A close friendship began at the Indiana colleges with (then) Professor Barton Warren Evermann with whom later he was associated in many scientific investigations.

In the fall of 1896 he followed Dr. Evermann to the U. S. Bureau of Fisheries (then the United States Fish Commission) with which he was connected throughout the re-

mainder of his active career. In 1897 he and Dr. Evermann carried on fishery investigations in some of the southern states. Later in the same year he joined the Fisheries Steamer *Albatross* and accompanied her to Alaskan waters for a season of work in the fisheries. The two following years the investigation of salmon in the streams of California occupied his attention. In this he was associated with Cloudsley Rutter. In 1900 and 1901 he was back on the *Albatross* engaged on Alaska fishery problems, and in 1902 he worked in Hawaii.

During the summers of 1903, 1904 and 1905, a work on the life history and young stages of Alaskan salmon was completed. The report which was published in the Report of the Commissioner of Fisheries for 1906, marks the beginning of an epoch in the study of these important food fishes, and its importance has only lately come to be realized in fish-culture. The clear, concise language shows the hand of the master workman, and the thoroughness with which each problem was attacked is the chief mark of the true scientist. His health failed in 1905, while he was in the field on these investigations, but apparent full recovery was made after a short stay in Arizona.

The *Albatross* sailed on a winter cruise to the south Pacific for Alexander Agassiz during the winter of 1904 and 1905 and Mr. Chamberlain accompanied the vessel as naturalist. The summer of 1906 was spent with the ship in north Pacific and Japanese waters, while from 1907 to 1910 he was in the Philippines. The last cruise closed his connection with this famous vessel. During her most active period Mr. Chamberlain was aboard and attended to the preparation of a great many thousand specimens of marine animals for later examination of specialists. The impersonal manner in which the records of the *Albatross* must necessarily be kept is regrettable. Thus some pieces of iron, fastened together in the form of a ship and named after a bird will live for centuries in the annals of science but the guiding hand which caused the machinery to produce the treasures of the deep, passes to oblivion, unmourned except by his

circle of personal friends. Mr. Chamberlain was instrumental in the bringing to the surface many hundreds of strange new mollusks, crustaceans and echinoderms, yet apparently his name has not been bestowed upon a single one. Two fishes and an Alaskan bird, however, have been named for him.

During the seasons of 1911 and 1912, Mr. Chamberlain filled the position of Alaska salmon agent and worked in the northern territory. In 1913 he was appointed naturalist of the Fur-seal Service and reached the Pribilof Islands just three days before the severe attack from which he never fully recovered. He was conveyed to the states, desperately ill, and the climate of Arizona again helped to only a partial recovery.

G. DALLAS HANNA

MUSEUM,
CALIFORNIA ACADEMY OF SCIENCES

SCIENTIFIC EVENTS

MOVEMENT OF THE POPULATION IN THE GERMAN EMPIRE

DURING 1919 and 1920, according to data recently published by the government statistical bureau and quoted in the *Journal of the American Medical Association*, the number of marriages in the German empire exceeded, by a considerable margin, the figures for the prewar period. In the five years from 1914 to 1918, inclusive, almost half a million marriages less were contracted than would normally have been the case. However, this notable falling off in marriages during the years of the war was compensated for, in the main, during 1919 and 1920; for in these two years the number of marriages reached the high figures of 842,787 and 851,508, respectively. Whereas in 1913 there were only 7.7 marriages to 1,000 inhabitants, in 1920 there were 14.8. Normally, forty marriages to 1,000 inhabitants could have been expected during the five years of the war, but, instead, only 25.1 marriages were entered upon. Eighty-two per cent. of the decrease has been made up during the last two years.

In 1914, the number of children born was 1,830,892. In 1915 it had fallen to 1,040,209

and in 1917 to 939,938. In 1918 the number had risen again to 956,251. In place of the normal 8,950,000 births in the period from 1914 to 1918, we find only 4,550,000 recorded, which signifies a loss of 4,400,000 due to the war. In 1919 the total number of children born was still about 400,000 below normal. Not until 1920 was the number of births again about normal, the records showing 1,512,162 births, or 27.1 to every 1,000 inhabitants, as compared with 1,707,834 births, or 28.5 per thousand inhabitants in 1913. The number of deaths in 1920 was 888,795, 16.3 deaths to every 1,000 inhabitants, the mortality for 1919 having been 16.1 per thousand. The last year before the war (1913) showed a mortality of 924,919, or 15.8 per thousand inhabitants. Especially during the first three months of 1920 the mortality rate was very high. More particularly, diseases of the respiratory organs and influenza exacted many victims during this period. In Berlin, more than a third of all deaths, namely, 37.7 per cent., were due to diseases of the respiratory organs, whereas during the first quarter of 1913 only one seventh of all deaths in Berlin were ascribable to such causes. During the last three quarters of 1920, the mortality rate fell considerably, having been 14.9, 14.5 and 15.4 per thousand inhabitants, as against mortality rates of 19.9, 22.0, 19.7, 20.8 and 25.1 for the five-year period from 1914 to 1918, inclusive. The year 1919 showed a slight excess of births over deaths and the year 1920 a still greater excess.

ACCIDENTS DUE TO EYE DEFECTS

THE Committee on Elimination of Waste in Industry of the American Engineering Council has made public a report on accidents due to eye defects. The total number of industrial blind in the United States is given as 15,000 or 13.5 per cent. of the total blind population, this type of injury being the leading causative factor of blindness, according to the report, which was prepared by Earle B. Fowler. The eye is involved in 10.6 per cent. of all permanently disabling accidents.

The report stresses the importance of correcting subnormal vision among employees, saying that excess eye fatigue results in conditions which must produce a time labor loss from reduction in quantity and quality production. Substandard vision was found to be of great frequency. One investigation showed that out of 2,906 garment workers only 743 or a little over 25 per cent. had bilateral normal vision, 17 per cent. having normal vision in one eye, with the other defective. The highest percentage of defective vision was in the class of workers who made the greatest use of their eyes.

An examination of more than 10,000 employees in factories and commercial houses found 53 per cent. with uncorrected faulty vision. Of 675 employees in a typewriter company, 58 per cent. were found to be in need of correction by glasses. Of the rejections in the National Army, 21.7 per cent. were because of eye trouble. An examination of the vision of 3,000 employees in a paper box factory in Brooklyn, N. Y., showed that the percentage of normal was only 28. In every group of workers examined there were a large number who fell below the line and this number becomes appreciably greater if those who have subnormal vision are taken into account. The report continues:

As in the correcting of other factors of occupational hygiene, standards have been set, so, after further study, visual acuity standards will have to be determined for each grade of workers and readjustments made, with alterations in our methods of testing acuity to suit conditions, until these standards give us the necessary minimum for each kind of work. As examinations are made at present, any set level would exclude workers shown by practical test to be very efficient producers.

Many subnormal eyes will work well even for fairly trying work if conditions are good. Therefore, it is first of all urgent to bring the working conditions up to the best, on the basis now understood.

Even the most superficial survey of lighting conditions reveals that in the majority of plants there is much improvement possible, in spite of the actual increase in production quantity and quality when poor illumination is corrected to standards now con-

sidered satisfactory. There seems to be no question of loss due to faulty conditions.

One estimate, the report stated, placed the loss due to faulty conditions in this country as above the entire cost of illumination. In 446 plants investigated only 8.7 per cent. were found to be in excellent condition, the other ratings being: Good, 32 per cent.; fair, 29.1 per cent.; poor, 18.8 per cent.; very poor, 3.5 per cent.; partly good, partly poor, 7.8 per cent.

THE YALE FOREST SCHOOL

STUDENTS from twenty-four universities and colleges, including four foreign countries, will attend the Yale Forest School at New Haven this year. Twenty-one men are candidates for the degree of Master of Forestry. The institutions represented in this attendance include the state universities at Cornell and Syracuse, N. Y., Maine, Minnesota, Montana, Washington, California, Pennsylvania, Missouri and Michigan. The foreign students come from the University of Christiania, Norway, Melbourne University, Australia, South African College, Capetown, South Africa, and University of Nanking, China. Yale continues to equip Chinese students to carry on the work started by former graduates—this year two will be in attendance. The students from Australia and South Africa are sent by their respective governments.

Owing to the growth of the school, new quarters were needed, and these will be secured through the recent gift of \$300,000 from William H. Sage, B.A., Yale, '65, of Albany, N. Y., which will be devoted to the erection of a forest school building in memory of his deceased son, DeWitt Linn Sage, of the class of 1897.

During the fiscal year 1920-21, graduates of the Yale Forest School were chosen to fill 49 positions in forestry, including 10 in government work, 9 in state forestry departments, 11 as teachers in other schools of forestry, 11 as managers of forest estates or for corporations owning forest land, 5 with lumber companies, 2 in forest products and 1 in

city forestry. Among these positions was that of chief inspector of forests for New Zealand, consulting forest engineer for the government of India, chief of the timber section of the Income Tax Bureau, forester for the province of Shantung, China, state forester of Connecticut, commissioner of forestry for Maine, deputy commissioner of forestry for Pennsylvania, forester for Illinois, professor of forest engineering, Syracuse, special investigator, in tropics, for Western Electric Company, and many other positions in national, state and private forestry, lumbering, wood products and kindred lines.

Recognition of the versatility and training of graduates of Yale in forestry has caused a demand for their services which the school has been unable to supply, and an increasing field is opening up in commercial lines, in the handling of lumber sales, tropical products and by-products. At the same time the increasing interest in forestry by state and private land owners is giving rise to a demand for foresters in increasing numbers to fill these positions.

THE AMERICAN PUBLIC HEALTH ASSOCIATION

THE fiftieth annual meeting of the American Public Health Association will be the occasion of a Health Fortnight. From November 8-19, New York City will be the scene of activities connected with this event, and the publicity with its slogan, "Health First," will stimulate interest throughout the country. Health Fortnight will include three major divisions—a Health Institute from November 8-11; a Health Exposition, November 14-19; the Fiftieth Annual Meeting of the American Public Health Association, November 14-19.

The Public Health Exposition will be conducted under the joint auspices of the Department of Health of the City of New York and the American Public Health Association. Already allotments of space indicate that at least two entire floors of the Grand Central Palace will be occupied by the exhibitors. The exhibits will include those of educational

and philanthropic organizations and those of commercial houses producing approved articles of health value. The profits from the sale of tickets, after the cost of the Exposition and the Convention are defrayed, will be devoted to establishing nutritional clinics for the benefit of undernourished children.

The Health Institute from November 8-11 will present to visitors an opportunity to see the operations of established methods applied to various phases of public health work. About forty demonstrations have been planned.

Following the week of the Institute and the observance of Health Sunday, will come the opening of the scientific sessions, the meetings of the American Public Health Association in celebration of its semi-centennial. The sessions will begin on November 14 and the headquarters will be at the Hotel Astor. The scope of the meetings is indicated by their division into the following: General Sessions, Public Health Administration, Child Hygiene, Public Health Publicity and Education, Laboratory Section, Vital Statistics Section, Industrial Hygiene Section, and Food and Drug Section.

SCIENTIFIC NOTES AND NEWS

DR. LIVINGSTON FARRAND will be installed as president of Cornell University on October 20.

OWING to a severe illness from which he is slowly recovering, Dr. Ernest Fox Nichols is unable at present to take up the work of the presidency of the Massachusetts Institute of Technology.

DR. ALEXIS CARREL has been elected a national associate of the French Academy of Medicine, of whom there are only twenty.

THE College of Physicians of Philadelphia has awarded the Alvarenga prize to an experimental study of the "Selective Bacteriostatic Action of Gentian Violet," by Dr. John W. Churchman.

DR. MARIE M. LONG has been appointed head of the department of child hygiene of the city health department, Memphis, Tennessee.

PROFESSOR G. W. O. HOWE, of the City

and Guilds (Engineering) College, has been appointed superintendent of the electrical department of the British National Physical Laboratory.

MR. J. BARR, head of the textile analysis department of the City of Bradford Conditioning House, has been appointed manager of the new yarn-testing bureau at University College, Nottingham.

DR. WILLIAM WALTER CORT, associate professor of helminthology in the school of hygiene and public health of the Johns Hopkins University, has returned after spending four months studying hookworm larvæ in Trinidad, West Indies. He was director of the expedition sent out for that purpose by the International Health Board of the Rockefeller Foundation.

MR. JOHN RITCHIE, associate editor of the *American Journal of Public Health* since 1918, has relinquished this position on the removal of the journal from Boston to New York.

DR. EDWARD A. SPITZKA has been appointed chief of the Medical Rating Section in the New York Office of the U. S. Veterans' Bureau, at 23 West 43d Street.

DR. THOMAS S. ROBERTS, professor of ornithology and associate curator of the zoological museum of the University of Minnesota, gave a lecture on Itasca Park, on September 23, in the lobby of the Mayo Clinic. The lecture was under the auspices of the Mayo Foundation Chapter of Sigma Xi and the Rochester Unit of the Minnesota General Alumni Association.

WE learn from *Nature* that the death took place on September 11, at the age of seventy-one, of Mr. R. E. Baynes, senior student of Christ Church, Oxford, and Lee's reader in physics.

MR. G. W. WALKER, F.R.S., known for his work in physics and seismology, died on September 6 at the age of forty-seven years.

THE annual conference of Potato Growers was held from October 4 to 6 at the University of California Farm School at Davis. The production and marketing of potatoes

was presented in lectures, discussions and demonstrations at the University Farm Gardens. These lectures were given by members of the staff of the College of Agriculture of the University of California and the State and Federal Department of Agriculture. The meetings of the first two days were at Davis and the meetings of the third day at the University of California campus at Berkeley.

AN institute of hydrology and climatology, containing laboratories, a museum, and a library, was inaugurated recently at the College of France. Lectures in hydrology will be given, and courses will be held to train specialists for watering-places and thermal and climatic stations.

IT was recently reported in *SCIENCE* that Baron Edmond de Rothschild had contributed 10,000,000,000 francs for the endowment of an institute for scientific research. The foundation will be administered by a scientific council, composed of delegates from scientific institutions devoted to the study of physics and chemistry. It will include two representatives of the Academy of Sciences—one, each, from the sections of chemistry and physics. The Collège de France, the Museum d'Histoire Naturelle, l'Ecole Supérieure des Mines, the Faculté des Sciences de Paris, the Faculté de Pharmacie, l'Ecole Normale Supérieure, the Conservatoire National des Arts et Métiers and l'Ecole Polytechnique will each have one representative. There will also be several members elected by the council itself, so that the total number of members in the council will reach approximately twenty-five. The foundation will have at its disposal each year 600,000 francs to be distributed among investigators. In accordance with the terms of the endowment 300,000 francs must be distributed in small amounts; the balance may be bestowed in the form of one or more lump sums for costly researches of great importance. Educational establishments and government laboratories will not share in the grants offered by the foundation, as these will be reserved exclusively for the use of independent investigators in the field of physics and chemistry.

THAT Chile possesses certain agricultural products which may prove of great economic benefit to California is the belief of J. W. Gilmore, professor of agronomy at the university, and for the year 1921-22 exchange professor at the University of Santiago, Chile. Professor Gilmore has found a self-propagating bamboo tree which grows on dry lands, yet affords abundant forage for cattle during the summer months when other fodder is scarce. He also tells of two new beans that he has found, one of which is grown among the Indians of Chile, and the other a species which is suitable for higher elevations. He is collecting samples of all beans grown in Chile, and expects that some of them will prove to be better than those we already have. Another discovery which has been made by Professor Gilmore is a new white-seeded vetch, which he says should be a good cover crop for our orchards. Yet another is a new raisin grape grown in the dry lands of northern Chile which is exceptionally rich in sugar and which produces raisins of high quality.

The Journal of Terrestrial Magnetism reports that, according to information received from Dr. C. E. Adams, government astronomer and seismologist of New Zealand, a New Zealand Astronomical Society was recently established, and it is proposed as soon as possible to incorporate the society under an Act of Parliament. It is further hoped "that the Astronomical Society will be able to establish branches of the International Astronomical Union and the International Geodetic and Geophysical Union." The members include Dr. Adams, Dr. C. C. Farr, Professor E. Marsden, and practically all the astronomers and physicists of New Zealand.

THE *Journal* of the Washington Academy of Sciences states that scales for the measurement of length are now being constructed directly from the fundamental wave lengths of light without the use of any intermediary standard such as the standard meter bars. For example, the Bureau of Standards has recently completed the rulings on a 6-inch standard scale for a manufacturing concern,

using light waves from a neon tube as the length.

NATURE states that after an interval of seven years the Geological Society of London has been able to resume the issue of its annual index to "Geological Literature Added to the Geological Society's Library," which is a complete work of reference, both as to subjects and as to the output of individual authors. The present part brings the matter down to the close of 1913.

FORECASTS of the wheat yield in the northern hemisphere issued by the International Institute of Agriculture show that it will be approximately 50,200,000 tons, compared to 51,300,000 in 1920, according to a press dispatch from Rome. The crop in Europe, leaving out of consideration Great Britain, France and Germany, is estimated at 12,000,000 tons, compared to 10,500,000 last year. The United States and Canada are expected to produce 28,500,000 tons, against 28,600,000 tons in 1920, and India, Japan, Algeria, Morocco and Tunis will, it is said, yield 9,400,000 tons, against 12,000,000 harvested last year. The rye yield is computed at 8,200,000 tons, as against 6,700,000 tons in 1920, while barley shows an increase of 2.4 per cent. Oats, however, have suffered from the drought, and show a decrease of 12.3 per cent. The maize yield, based upon returns for the United States, shows a decrease of 6.2 per cent.

The New York City branch of the Alumni Association of the University of Wisconsin has established an annual scholarship of the value of \$700 to be known as "The Zona Gale Scholarship"—named in honor of a distinguished graduate of the university—to be awarded to a student who has shown that he possesses special talent of an unusually high order, and who wishes to spend all his time in the university in pursuing courses which he thinks will develop his special talent, without being required to complete studies in which he has little or no interest. The holder of the scholarship will not be required to satisfy the regular entrance requirements if he is deficient therein.

This scholarship is open to any person in any part of the country who has given evidence

of exceptional creative ability in any field of human interest and activity. Nominations for the scholarship may be made to the registrar of the university by superintendents or principals of schools, by teachers, or by any one else.

UNIVERSITY AND EDUCATIONAL NEWS

YALE UNIVERSITY has received gifts and pledges for the \$2,000,000 additional endowment required to meet the terms of the conditional offer of \$3,000,000 made at commencement in 1920 by "an anonymous friend of the university." No definite statement has been made of the manner in which the endowment will be used, but it is said that the Sterling bequest of \$18,000,000 and the Harkness gift of about \$6,000,000 had bestowed upon the university building facilities without provision for professorships, for which additional endowment is urgently needed.

APPRAISAL of the estate of the late William F. Armstrong, of New York, shows that he left property valued at \$1,822,192. Public bequests exceeding \$1,000,000, include a bequest of \$100,000 and the residuary estate, amounting to \$726,786, to Wesleyan University.

DR. GEORGE W. PIERCE has been appointed as Rumford professor of physics at Harvard University, to succeed Dr. Edwin H. Hall, who has retired from active teaching, and Dr. Theodore Lyman has been appointed Hollis professor of mathematics and natural philosophy, the chair successively held by the late Benjamin Peirce and Wallace C. Sabine.

ADDITIONS have been made to the senior staff in chemistry at the University of Illinois as follows: Drs. H. A. Neville, and C. D. Hurd, of Princeton; Dr. Edith H. Nason, of Yale; and Dr. T. E. Phipps, of California, in the division of inorganic chemistry; Dr. B. L. Souther, of Harvard, in the division of organic chemistry; Dr. G. F. Smith, of the University of Michigan, in the division of analytical chemistry; Dr. E. K. Carver, of Harvard, in the division of physical chem-

istry; Dr. M. J. Bradley, of Illinois, in the division of industrial chemistry, and Dr. R. E. Greenfield, of Illinois, in the division of sanitary chemistry and water analysis.

JULIAN D. CORRINGTON has resigned the position of curator in the department of zoology of Cornell University, to accept the appointment of associate professor of biology in the University of South Carolina, Columbia, S. C.

DISCUSSION AND CORRESPONDENCE

GRAND AURORA OF SEPTEMBER 1-2, 1921 (AT SILVER LAKE, N. H., LAT. 43.9° N.)

AN unusual aurora was seen at Silver Lake, N. H. (lat. 43.9° N.), on the night of September 1-2, 1921. Auroral glow was first noted at about 8 P.M. (75th mer. time). At 9 it was a bright arch with some streamers, and at 9:30 stretched from about NW. to NE., was double and locally knotty, and from time to time showed some motion when faint streamers reached up to a height of 30° above or down to the horizon under the general arch. Towards 10 the lights seemed to be getting fainter. At 2 A.M. I was awakened to see the sky filled with enormous flashing curtains. The whole family turned out onto the lake. No lights were needed and the pulsations were sufficient to be readily apparent in the house without looking at the sky. Viewed from the calm, "streaming" lake the sky was magnificent. Great folds of perhaps a dozen whitish curtains covered the sky except for a segment about 15° high in the south. Here and there a reddish tinge showed at the base of brighter folds. Waves of light rapidly traversed the sky upwards to the magnetic zenith, where some of the filmy curtains met in solid light traversed with beautiful curved lines. The stars, which were brilliant, attracted the attention of the small children nearly as much as did the sheets of light that "winkled." The youngest, 15 months old, gazed steadily for several minutes at the bright flickerings in the NW. at 2:30. The display slowly faded, but at 2:45 there were still some lights in the zenith and to about 30° south of it. The aurora, flashing all the time

continued bright at least in the NW. till 3:45 A.M., and probably later till the dawn blotted it out. Auroral pencils and sharp streamers being notably absent there was nothing to detract from the splendor of the great curtains.

On the following two nights there may have been auroras behind the clouds. On that of the 4th a moderate display with some pretty streamer action at about 3 A.M. was visible all night from Mt. Washington. The following two nights were cloudy. Then another display occurred. At 7:42 P.M. on the 7th a smooth auroral arch covered most of the sky up to the pole-star (45°) at Carter Notch, but by 7:57 there was but a low arch. The maximum with some streamers occurred apparently at about 10:30 P.M. The aurora was visible at other times throughout the night. On the evening of the 8th a faint arch broken by streamers in the NNW. was visible; and on the following evening there seemed to be a faint arch.

CHARLES F. BROOKS

SILVER LAKE, N. H.

THE COCCIDÆ OF CEYLON

ENTOMOLOGISTS are indebted to Mr. E. E. Green for by far the most ambitiously conceived and most admirably executed contribution to the knowledge of the Coccidæ or scale insects that has ever been made—the "Coccidæ of Ceylon." This work, which is still incomplete, has been issued in parts and the final part would have appeared long ago but for the interference of the war. I am informed by Mr. Green that as matters now stand the long-hoped-for appearance of this final volume seems indefinitely postponed because of the enormously increased costs of printing. The only hope that he may be able to proceed with its publication at all lies in the possibility of obtaining adequate assurance that the entire issue can be sold.

It may at first appear that a work which deals with but a limited aspect of the fauna of a comparatively remote island such as Ceylon can have but little interest for Americans. Yet such is decidedly not the case with this

work. Many of the species included are practically cosmopolitan and the ever present possibility of the spread of others through the agencies of commerce makes desirable any information that can be obtained concerning them. The Coccidæ of Ceylon is indispensable to any one who is at all seriously interested in the scale insects. Its completion is a matter in which all students of the Coccidæ should take a personal interest.

The price of the final part has been set at 3 pounds, which is the actual cost of publication, and of the entire series of five parts at 8 pounds. To those who are familiar with the work the price will not seem in the slightest degree excessive. Mr. Green says:

If I could get definite promises of support from a considerable number of prospective purchasers, I should feel justified in going ahead at once.

It is sincerely to be hoped that these promises may be forthcoming. Correspondence should be addressed to Mr. E. E. Green, Way's End, Camberley, Surrey, England.

G. F. FERRIS

STANFORD UNIVERSITY, CALIF.

A METHOD OF PROTECTING MICROSCOPIC SECTIONS FROM MECHANICAL INJURY

THOSE who have to deal with classes using chiefly microscopic slides, especially of embryos, will appreciate the fact that most of the damage to sections comes not from breaking of the slide but as the result of pressure on the cover glass. Such damage would not be possible but for the fact that most of the balsam remains fluid, even after many years, and consequently offers no firm support to delicate structures. If only some firm transparent substance could be found in which the sections might be imbedded the defect resulting from the fluid nature of the balsam might be counteracted and the tissues kept in perfect condition for successive classes.

Celloidin sections fulfill most if not all of the mechanical requirements, but are unsuitable because of the great amount of time required for cutting and mounting serially. However, these considerations led to the development of the following process which combines all of the advantages of the paraffine

method with some of those of the celloidin technique.

From ordinary series of paraffine sections the paraffine is removed in xylol, the slides being transferred with great care to 100 per cent. alcohol and then to 1 per cent. parlodion from which they are removed slowly one by one and placed in 80 per cent. alcohol, an old method for securing sections to the slide especially for preventing embryonic membranes from floating about. After staining by any method and dehydrating, the slides are removed singly from 100 per cent. alcohol, placed in a horizontal position, and the sections *quickly* and *evenly* flooded with 2 per cent. parlodion. About 10 to 14 drops, from an ordinary 2 c.c. pipette, placed in two rows and allowed to stand one to two minutes uncovered were found to form a film of very uniform thickness and of sufficient firmness to be hardened without wrinkling when slipped into 80 to 90 per cent. alcohol. The proper degree of drying is indicated by a minute rippling of the surface of the celloidin. The slide is again dehydrated, care being taken not to use alcohol strong enough to dissolve the celloidin; and then cleared in a mixture of 40 per cent. beechwood creosote in xylol, followed by plain xylol. Creosote alone clears quite as well but does not flow as readily as the mixture which, moreover, clears from 95 per cent. alcohol. Such slides may be thoroughly drained in the air for several minutes before covering in the ordinary way with balsam and a cover glass.

It should be noted that the parlodion must be applied *evenly* so that the balsam will dry without the formation of large air bubbles. The latter can be entirely avoided. Furthermore, thinner films suitable for use with oil immersion objectives can be obtained by using a solution of parlodion somewhat more dilute and less in quantity.

By this method sections of the most delicate structures are imbedded in and under a perfectly transparent, unstained layer of celloidin so tough and resistant that sufficient pressure may be applied to the cover-glass to crush it without the least injury to the tissue. Slides

so treated can not be distinguished from ordinary slides.

J. A. LONG

ZOOLOGICAL LABORATORY,
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QUOTATIONS

THE BRITISH ASSOCIATION

THE Edinburgh meeting of the British Association for the Advancement of Science came to a successful end yesterday. It was the largest in numbers for many years; and although the deficit on the accounts of last year made it impossible to devote money from current funds to research, there is a better prospect for the immediate future. Thirteen sections sat concurrently during the greater part of the week. It can not be pretended that all the proceedings conformed with the normal definition of science. Humor in school children, episcopal opinions on citizenship, the relative merits of Latin and Esperanto, and the history of Old Edinburgh are worthy occupations of the human mind, but lie somewhat uneasily with sterner subjects. The general committee showed a marked reluctance even to consider the advantages of a stricter definition of the scope of the association, and the adherents of sections more loosely attached to experimental science very naturally opposed proposals which they feared might lead to their extinction. On the other hand, the policy of the Council in arranging intersectional discussions on topics of wide interest was warmly approved in theory. In practise it led to some of the largest audiences in the history of the association. It was possible to give in our columns only slight indications of the general purport of the discussions on the structure of molecules, the age of the earth, and instinctive behavior; but our special correspondent laid stress on the wide interest taken by the members of the association in these deeper problems.

Sir Edward Thorpe, the president, was unfortunately prevented by illness from all but a formal attendance on the last two days of the meeting. But his opening address, read for him by the principal of the university,

dealt with the central point of contemporary scientific interest. Critical phases occur in the evolution of knowledge of such a kind that they seem to be revolutions in thought. The new vision of the atom as an ordered system, a macrocosm of energy in microcosmic space, is one of the greatest of these stages in the history of man's conquest of Nature. Doubtless, as the president explained, the discovery was reached along many converging paths of theory and of experiment. It was even predicted, fifty years ago in a presidential address, also at an Edinburgh meeting of the association, when Kelvin summed up the program of the past and suggested the lines along which future research must move. Sir James Dewar, at a dinner given by the Royal Society of Edinburgh last Tuesday, recalled even earlier predictions. But its attainment has led to results almost overwhelming in their importance. It has reconciled physics and chemistry in a higher unity. It has given a clock by which the age of the earth may be told. It has allowed astronomers to explain the pulsations of the distant stars. It has opened up prospects of a new and inexhaustible source of power for the practical uses of mankind. The Edinburgh meeting of the British Association will long be remembered as that at which the new atomic age was made known to those outside the inner ring of science.—*The London Times*.

SCIENTIFIC BOOKS

KEEN'S SURGERY

The first six volumes of Keen's "Surgery" recorded the progress of surgery down to 1913. In the preface to the additional volumes Dr. Keen states that the general purpose is to make available the lessons of the war for the surgery of peace and to set down every worth while surgical achievement since the war; and both of these objects have been accomplished in a masterful way. The two volumes consist of a series of monographs written by authors of international reputation and comprise 1800 pages with 996 illustrations, 29 of them in color.

The editor counts it "a crowning privilege of his long life to be associated with such a distinguished company of authors." The distinguished authors also doubtless count it as an inspiring privilege to have been associated in the production of the work with such an enthusiastic student and able teacher.

In the two new volumes the names of many former contributors are absent and new names are added. There has also been some shifting of subject matter. The editor has added many footnotes of great help to the reader, and has made many cross references to statements of the different authors of the various chapters. Typographical errors are few and there is evidence of careful editing and proofreading.

Much space in the two volumes is devoted to the organization of the medical departments of the Army and Navy. The chapters by Colonel Ashford of the U. S. Army, by Captain Bell of the U. S. Navy and by Lieut. Commander Stephens of the British Navy occupy 183 pages, including many photographs, drawings, diagrams and lists of furniture and equipments. Much information is given of value in civil practise, such as the treatment of shock, burns and suffocation by fumes and smoke.

The chapter on Gas Gangrene by Sir Cuthbert Wallace is complete and most beautifully illustrated. Some qualification seems necessary for the statement it contains that "suture of the main artery is recommended as a prophylactic measure against massive gangrene."

The chapter by Cannon on Traumatic Shock, although occupying only 19 pages, is exceedingly valuable, being not only authoritative and scientific, but practical as well.

Sir William Thorburn in his contribution on Injuries of the Spine and Spinal Cord emphasizes the treatment of the patient as a primary principle. The importance of the management of the bladder for example is stressed by the remark that "the bladder holds the key to life or death for the patient." In his chapter on Injuries to the Peripheral Nerves the author fails to mention the work

on the suture of nerves by certain Americans, especially Hober, Dean Lewis and Frazier.

Military Surgery of the Vascular System by Matas is a scholarly contribution. It is a pity that much of it is in fine print. In the treatment of gunshot wounds of the large vessels Matas defends the opinion so long held by him that when possible large blood vessels should be sutured and not ligated.

Surgery of the Head, previously contributed by Cushing, has been written for Volume VIII. by Neuhoff. It is a splendid résumé of the subject but no mention is made of Frazier's method of osteoplastic repair of cranial defects.

The Relation of the Dental Surgeon to the Treatment of Fractures of the Jaw is described by Darcissae of Paris.

Chevalier Jackson's contribution upon Laryngoscopy, Bronchoscopy and Esophagoscopy is a monument to the technical achievements and teaching ability of this great man.

Surgery of the Thorax by Heuer of Baltimore is a scholarly contribution occupying 80 pages and referring to 118 literary contributions. The enormous progress made in the surgery of the thorax during the war could scarcely be recorded in less space than this. The compliment paid to one of the younger surgeons of America by including him among the list of authors is amply justified by his contribution to the system.

Crile's chapter on Surgery of the Abdomen and Pelvis is a concise one-man contribution.

There is a short chapter by Mayo and Balfour on Surgery of the Gall Bladder and the Biliary Ducts, which deals principally with injuries and repair of the hepatic ducts.

Deaver and Pfeiffer have taken the place of the lamented Murphy in discussing appendicitis. The chapter is a short statement of Deaver's personal opinions based upon the experience that this surgeon has had with the disease. It is a great comfort to learn on page 443 that he is finally converted to the belief that morphine may be useful "to induce sleep if necessary, as well as to allay anxiety." The case report on page 441 also

indicates that he has seen some cases of appendicitis with peritonitis in which it is wise to delay operation. His remarks on the abuse of purgatives on page 449 should be widely read by general practitioners.

The chapter on the Bladder and Ureters by Bransford Lewis is well illustrated by pictures of the many instruments devised by the author and the text of the subject is brought up to date.

Surgery of the Prostate by Hugh Young occupies 76 pages and includes a description of the operation recently devised for the cure of recto-urethral fistula.

Physiotherapy in Surgical Treatment has made enormous advances as a result of the war and has come to be thoroughly appreciated. This chapter by McKenzie is an admirable presentation of the subject in its practical value to surgeons in civil life.

Four chapters are devoted to the diagnostic and therapeutic usefulness of various biologic sera and vaccines and chemico-therapy in surgical diseases; the status of radium in surgery; the diagnostic and therapeutic uses of the X-ray; and electro-desiccation and electro-coagulation methods in surgery. It is a question if it would not be more satisfactory to include the essentials of this knowledge in their proper place in studying diseases for which they are employed rather than in separate chapters.

The Surgery of the Infectious Diseases by George E. Armstrong, is a very practical chapter. The work by Keen many years ago in calling attention to the great frequency of surgical complications during typhoid fever has been of inestimable service in saving lives through the recognition and cure of surgical complications of the disease. The recent epidemic of influenza and the experiences in the camps with epidemics of measles, mumps and pneumonia have shown the great importance of being constantly on the lookout for surgical complications of affections hitherto regarded as purely medical.

The chapters dealing with ether and nitrous oxide anaesthesia have been rewritten. Harris's supplemental chapter on local anaesthesia

is full and authoritative. Hugh Cabot still regards spinal anaesthesia as having a place in surgery.

The chapter on Poison Gas in warfare is not solely of historic interest, because surgeons on ambulances and those connected with industrial plants and chemical laboratories will find much of practical importance.

The final chapter on a most successful method of dressing an artificial anus prepared by the editor himself is in the form of a case report and is the type of literature which is of the greatest practical use to surgeons and patients.

The index of the system consists of four "keys"; first, each volume as it stands upon the shelf carries a conspicuous label of the general subject matter it contains; second, as we open the book the table of contents is quite complete; third, each volume has a separate index; and finally, the complete index of the entire eight volumes occupies 182 pages in the form of a desk volume and makes it perfectly easy for one to find any reference he may desire.

STUART McGuIRE

SPECIAL ARTICLES A NEW GRAPHIC ANALYTIC METHOD

1. THE graphic methods which deal with a treatment of two or three variables are commonly based on a relation of the variables to a system of rectangular cartesian coordinates. If the equation is known the laws may be expressed in the customary way by the methods of analytic geometry.

If, however, we are confronted with a system of two or more equations which are so related to each other that the growth of one will influence the growth of another (in a negative and positive sense) the following method will furnish a means of expressing such movements in a concise form and in a manner well adapted for the purpose of analysis.

Suppose we have three general equations:

$$x = f(a), \quad y = f(b), \quad z = f(c),$$

where the change of a will affect x as well as y and the change of b will affect y as well

as z and if further $f(a)$, $f(b)$ and $f(c)$ are quotients expressed:

$$\frac{a}{b}, \quad \frac{a}{c} \quad \text{and} \quad \frac{b}{c};$$

we have then:

$$x = \frac{a}{b}; \quad y = \frac{a}{c}; \quad z = \frac{b}{c}$$

and notice that each quotient or independent variable is related to the other independent variable by the possession of one of its algebraic members.

If a number of equations which have a relationship of this nature is brought into a system of positive coordinates as shown in Fig. 1, the four quadrants and the coordinates

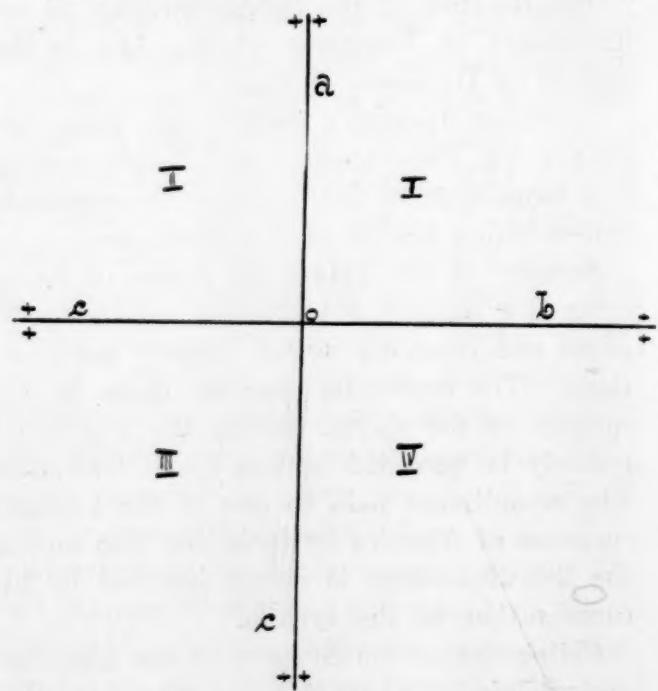


FIG. 1.

forming them may be named in the following manner:

- I. Quadrant $a b$
- II. Quadrant $a c$
- III. Quadrant $c c$
- IV. Quadrant $c b$

Therefore the ordinates of each quadrant will have two different coordinates or scale values with the exception of the third or neutral quadrant which axes have the same scale values c and are acting in a translative sense rotating the value c 90° to bring it in the third and last relationship with value b , in the fourth quadrant.

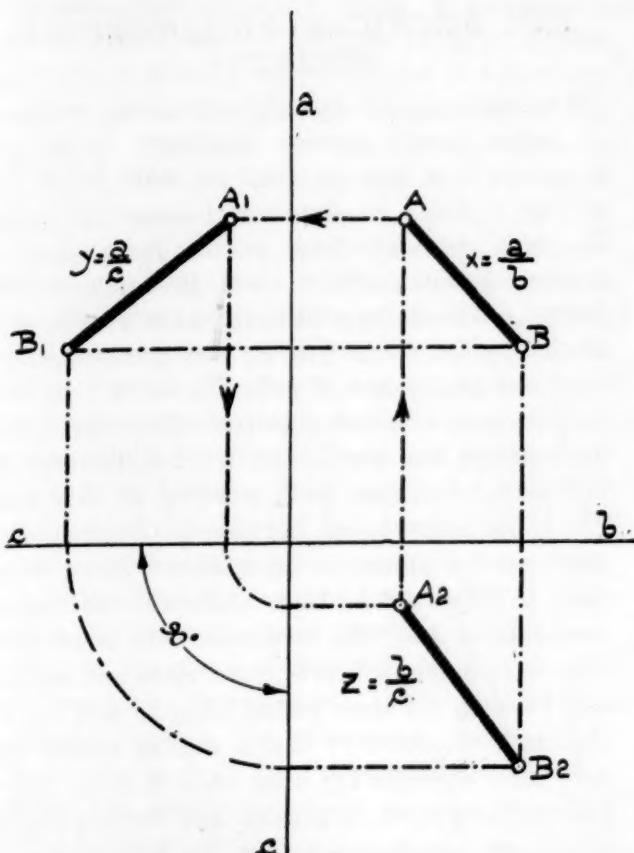
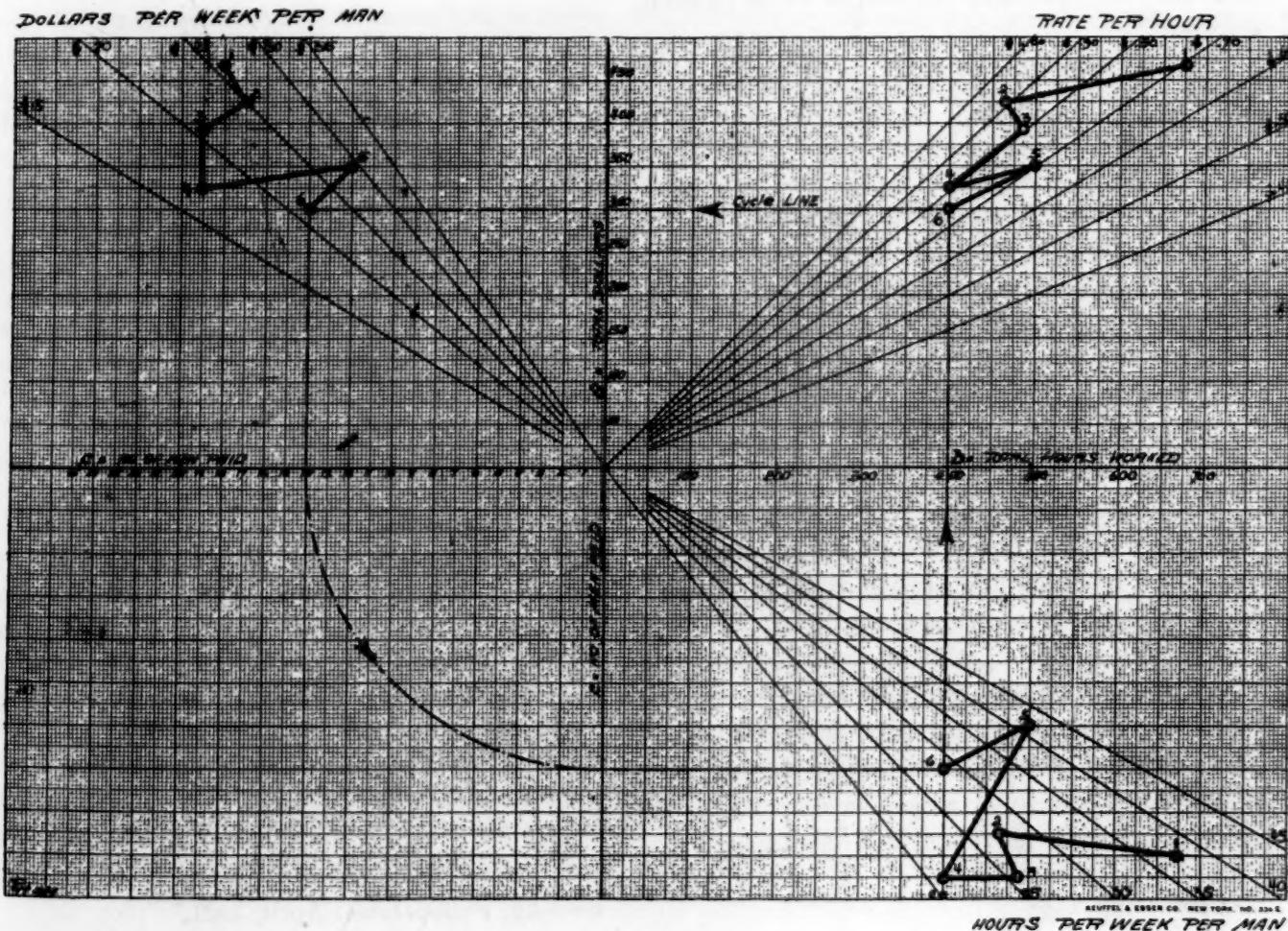


FIG. 2.

2. In such a system the growth (negative and positive) of a variable may be observed by connecting the plotted points of each quadrant which satisfy their respective equation with the points of each equation in the other quadrants, thereby obtaining for each set of three points a cycle line A, A_1, A_2 (as shown in Fig. No. 2). These points not only represent the actual values of x, y, z , but their location in reference to their respective axes represents the quotients expressed by the equations.

For example, Point A would represent by its location the quotient of certain values of a and b ; or A_1 would represent by its location the quotient of certain values of a and c , and so on.

The application of the method may be illustrated by an actual example. Suppose we have the statistical data shown in the table given below. These data may be advantageously analyzed as outlined (Fig. 3).



The *a* scale representing the number of dollars paid.

The *b* scale representing the number of hours worked.

The *c* scale representing the number of men working.

	<i>a</i> = No. Dollars Paid	<i>b</i> = No. Hours Worked	<i>c</i> = No. Men Working
1st week	469	675	18
2d week	425	464	17
3d week	393	485	19
4th week	325	400	19
5th week	350	500	12
6th week	300	400	14

The quotient a/b will represent the hourly rate paid. The quotient a/c will represent the amount paid per man. The quotient b/c will represent the hours worked per man.

The radiant lines starting from the point of origin of the coordinate system are the equations of lines which represent a constant quotient. The location of the points given by the actual values of the table with reference to the radiant lines of each quadrant therefore determines graphically the actual value of each quotient.

For example, in the sixth week we observe the location of point 6 in the *first quadrant* between a rate of \$.70 and \$.80 per hour (actual value $300/400 = .75$).

In the *second quadrant* (as connected by the cycle line) the location of point 6 is between \$20 and \$25 a week (actual value $300/14 = \$21.42$) and nearer to the \$20 line.

In the *fourth quadrant* (as connected by the cycle line) the location of point 6 is near the 30 hours per week line (actual value $400/14 = \$28.57$ hours).

If a longer period and a greater number of values are under observation, a moving average could be calculated and plotted in a similar way. There are a great number of data which have a similar relation to each other and may be presented and analyzed by this method.

Furthermore empirical data obtained by experiment may be subjected to this method and a possible positive or negative correlation of their respective movements determined.

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The etiology, prophylaxis, and serum treatment of yellow fever: HIDEYO NOGUCHI. *Leptospira icteroides* was first isolated in 1918 from cases of yellow fever in Guayaquil; later the organism was obtained from yellow fever cases in Merida, Yucatan (1919) and in northern Peru (1920). The finding has also been confirmed in Mexico by Dr. Perez-Grovas, who transmitted yellow fever from cases of yellow fever in Vera Cruz in 1920 and obtained cultures. The most recent confirmation has come from Dr. Le Blanc of the Rockefeller Institute staff, working in Vera Cruz. The killed cultures of *Leptospira icteroides* were first used for protective inoculation against yellow fever in Guayaquil in 1918, where 427 vaccinations were carried out. The results were so encouraging (the morbidity rate among vaccinated and unvaccinated during the same period being 11 and 110 per thousand, respectively) that a vaccine several hundred times stronger has been made in large quantities and employed in Mexico and various Central and South American countries, the total number of non-immune persons reported vaccinated being about eight thousand. The development of protection is slow, requiring about 10 days for completion, and persons exposed to yellow fever just before vaccination or immediately afterwards are not protected by vaccination. Excluding such instances, however, there has been no case of yellow fever among the eight thousand vaccinated in the various localities, while among unvaccinated persons during the same period and in the same areas there have been about seven hundred cases of the disease. The use of vaccine furnishes a rapid method of elimination of non-immune persons from areas where yellow fever is epidemic. By the application of sanitary measures to eliminate the mosquito carrier and vaccination in the meantime to cut off the supply of non-immune material from the infected mosquito, a threatening epidemic of yellow fever in Guatemala and Salvador in 1920 is reported to have been checked within one month from the appearance of the first cases, that is, before a second set of cases had developed. The value of vaccination as an emergency measure does not, however, minimize the importance of the anti-mosquito operations, the elimination of both factors—the non-immune human being and the infected mosquito—being essential

¹ Abstracts of papers presented at the annual meeting, Philadelphia, April, 1921.

to the eradication of yellow fever. A therapeutic serum is also available for treatment of yellow fever. It has already been employed in 152 cases, and persons treated before the third day of illness have almost invariably recovered, the exceptions being those cases in which the quantity of serum used was too small to have any effect. By the fourth day of illness the injuries to organs are so great as to be irreparable in severe cases of yellow fever. The usual mortality in yellow fever, 50 to 60 per cent., has been reduced to 9 per cent. by the use of the serum. The records of vaccination and serum treatment presented here comprise the work of a number of observers. The initial vaccination experiments in Ecuador were carried out with the cooperation of Dr. Pareja and the Dirección de Salubridad of Guayaquil; the statistics from Central America cover the work of Lyster, Bailey, and Vaughn; for the records of Mexican cases I am indebted to the Consejo Superior de Salubridad (Drs. Vasconcelos and Casasus), to the Junta de la Sanidad de Yucatan (Dr. Hernandez), and to Dr. Le Blane; the work in Peru was done with the cooperation and assistance of Dr. Kligler and the Peruvian health authorities.

Hereditary influences bearing on the resistance to tuberculosis: PAUL A. LEWIS. Certain inbred strains of guinea pigs, which have been maintained for a number of years at the Bureau of Animal Industry, Washington, D. C., have been tested by us as to their resistance to tuberculosis. It is found that these strains differ appreciably in the length of life after a standard inoculation. The differences between the strains are more considerable than differences due to other factors, such as sex, age, weight, etc. That the differences observed among the strains have a hereditary basis is also emphasized by the influence on resistance observed in crosses among these strains.

Signs of sanity: STEWART PATON. Probably the most important question in the world to-day is whether man is capable of directing intelligently the civilization he has created and organized. International as well as industrial peace can only be attained in proportion as we are capable of understanding and controlling human nature. Following the outburst of insanity in 1914, which plunged the world into war, no attempt has been made by statesmen or diplomatists at the peace conference to discriminate between the signs of sanity and insanity. In order to understand the nature of sanity one must use two methods of investigation: (1) analytical, (2) synthetical. Man has paid a heavy

price for neglecting the latter. He has studied parts of the human machine, but has made little effort to notice the behavior of the entire machine. Judging sanity and insanity is a biological and not a psychological problem; it is not a question of body and mind, but of body-mind. The organization of the body-mind in sanity: (1) provides channels for discharge of energy in action; (2) assists individual to face squarely problems of actual life and (3) rewards effort by definite sense of achievement and feeling of adequacy. Bolshevism, radicalism and the tendency to think in terms of class distinction are defense reactions of inadequates afraid of facing their own personal problems. Success of individual, future of democracy and the fate of our civilization depend upon the recognition of these biological principles and the cultivation of mental processes favorable for sane thinking and acting.

Grass rusts of the Andes (based on collections by Mr. and Mrs. Holway): J. C. ARTHUR. The grass rusts form a peculiar group of minute parasites of great interest to the botanist on account of their curious and varied forms and of equal interest to the agriculturist and economist on account of the injury they do to crops, especially cereals. The Andean region embraces a strip rarely more than a hundred miles in width of elevated plateaus and high mountains extending along the whole western border of South America through Colombia, Ecuador, Peru, Bolivia and Chile. The cereal crops and forage grasses are of economic importance throughout the region, but a study of the rusts affecting them had made little progress until the exploration undertaken by the Holways. Barely a score of forms had previously been reported, but the number is now more than double, and includes some that are new to science. Much critical knowledge has also been secured.

The action of bases and salts on biocolloids and cell-masses: D. T. MACDOUGAL. The strong metallic bases, potassium, sodium and calcium are found to exert a limiting effect in concentrations of $0.01M$ on agar, when applied as hydroxides or chlorides, but this action is reversed when solutions diluted to $0.001M$ or $0.0001M$ are used, in which concentration they may occur in living matter. A similar accelerating action for hydrochloric acid at 0.0001 normal was found. Biocolloids of agar and gelatine showed specialized and accelerated hydration in similar solutions. No connection could be established between the hydrogen ion concentration and swelling as agar shows exaggerated swelling at P_H values

from 4.2 to 11. Effects as of balanced solutions were obtained with agar, and suggestions of similar action with agar-gelatine-salt mixtures. The incorporation of nutrient salts in agar and biocolloids in minute proportions such as might occur in plants increased the swelling capacity of some mixtures, in contradiction to earlier announcements by the author. Roots of various plants showed special effects in swelling, and also variations according to the ecological type of these organs. Such differences are determined by the composition of the cell-colloids. Finally the facts confirm an earlier statement to the effect that all substances known to facilitate growth of plants accelerate hydration of growing tissues, and of biocolloids simulating their protoplasm when used in low concentrations equivalent to those in which they are usually encountered by living matter.

Growth of trees: D. T. MACDOUGAL. Extended measurements of the growth of many trees of a number of species have been made by the use of the newly designed dendrograph, which makes a continuous record of changes in diameter, and the recently perfected dendrometer, which registers total change in circumference. It is found that the period during which growth takes place even in equable climates with indeterminate seasons does not extend over more than two or three months, and that growth is not rhythmical in any sense, but depends upon food-supply, temperature, moisture and other environmental conditions. Awakening of buds, formation of leaves and flowers, and elongation of branches may occur many days or even weeks before trunks begin to enlarge. The leaves of a beech tree in Baltimore began to unfold April 10, 1919, and enlargement of the trunk began about May 18. Daily equalizing variations by which a tree may be actually smaller in mid-afternoon than at sunrise are greatest in the ash, pine, spruce, fir and walnut, and least in poplars, sycamore, beech and oak trees. Accurate measurements of the changes in trunks internal to the growing layer show that these variations are directly connected with the mechanism of the ascent of sap and are explainable upon the assumption of a rigid water column in a trunk composed of wood-cells and vessels capable of some shrinkage and expansion. Crudely expressed the trunk behaves like a heavy hose feeding from a pressure system to a fire engine. When the engine tends to take water faster than supplied, the hose tends to collapse; when the engine slackens its action, the hose swells.

Fishes of Ecuador and Peru: CARL H. EIGEN-

MANN. The fishes of the Guayas basin on the Pacific slope of Ecuador and those of the rivers of Chile are completely different in species. Even the genera with the exception of the mountain catfish *Pygidium* are all different. Excluding the marine fishes even the families and orders of fishes in the two areas are largely different. The differences between the two faunas are so great there is not a shadow of a doubt that in the main their origins were different. The Chilenian fishes came from the south. The Guayas fishes came from the Amazon. The Pacific slope of South America between Panama and Patagonia varies in width from a few yards in Colombia, west of the Atrato river, to a hundred miles or more. The slope is extremely wet in Panama and Colombia, varies from wet in the north of Ecuador to dry in the south of Ecuador. The slope varies from *dry* in northern Peru to *very dry* in southern Peru, and *almost* if not *absolutely dry* in Chile, south of Copiapo. The Guayas basin drains the area between a coast range and the Cordilleras of central Ecuador. The Guayas has the distinction of being the only river with a flow in the main parallel to the Andes. All the other Pacific slope rivers between the equator and Cape Horn (with the exception of the Rio Santa) flow direct from the Andes westward to the Pacific. The Guayas basin is the largest river basin draining into the Pacific between the equator and southern Chile. The rivers grow smaller south of Ecuador to northern Chile. A stretch of over 500 miles in northern Chile is crossed by but one river, the Loa. The first river south of the great desert of Atacama is the Rio Copiapo. I fished from Copiapo southward through central Chile over a stretch nearly a thousand miles long. The general conclusion reached is that the fauna of Chile is at its height between Concepcion and Valdivia. Going north from Valdivia one genus after another disappears. *Aplochiton*, a trout-like genus of Australia and Chile and *Galaxias*, another genus of Australia and Chile, reach their farthest north in the Bio Bio. The peculiar catfishes *Diplomyste* and *Nematogenys* reach their farthest north in the Maipo. *Percichthys* reaches the Aconcagua. North of the Aconcagua in the region of the extinct or dying rivers but three species of the Bio Bio fauna remain: a "peje rey," *Basilichthys*, the ubiquitous catfish *Pygidium* and *Cheirodon*. The little *Cheirodon* whose ancestors have come from tropical Brazil I caught as far north as Vallenar. In the Copiapo I caught no native fishes. The *peje rey* extends all the way to Lima, Peru.